Listing of Claims:

1. (Canceled)

2. (Currently Amended) A method of moving a given set of trains from their respective origins to their respective destinations on a rail network, said method comprising:

(i) forming a schedulable set of trains consisting of every train ~~all trains~~ not at its ~~their~~ destination ~~that have at least one unoccupied link~~;

(ii) removing from said schedulable set any train whose next movement may result in the network becoming deadlocked;

(iii) generating a dispatch decision time for each of the trains remaining in the schedulable set after having trains removed in step (ii), wherein the dispatch decision time is somewhere between the earliest time the train can start a next movement and the earliest time the train can complete its next movement;

(iv) generating a perturbed dispatch decision time for each of the trains remaining in the schedulable set after having trains removed in step (ii) by adding a random perturbation to the dispatch decision time of each train;

~~(ii) selecting the train from said schedulable set with the earliest start time from its current location, wherein said selected train is to travel from station S_i to station S_j;~~

~~(iii) forming a contender set of trains consisting of all trains that have as their next move a dispatch from station S_i to S_j and vice versa;~~

(v) ~~(iv)~~ selecting a ~~the~~ train from said schedulable ~~contender~~ set with the earliest perturbed dispatch decision ~~arrival~~ time ~~at its successor station (either station S_i to S_j)~~;

~~(v) for said selected train invoking a deadlock avoidance procedure, wherein if said procedure accepts the train then go to step (vi), or if the train is rejected then remove it from the schedulable set and if the schedulable set is not empty then return to step (ii) otherwise go to step (vii);~~

(vi) scheduling said selected train over its chosen movement ~~link~~ to its successor station;

(vii) repeating steps (i) to (vi) ~~return to step (i)~~ until ~~all trains are at their destination or~~ the schedulable set is empty to create a possible schedule;

(viii) assessing said possible schedule by means of an objective function;

(ix) repeating steps (i) to (viii) to create N possible schedules; and

(x) selecting a desired schedule from said N possible schedules on the basis of said objective function and moving said set of trains from their respective origins to their respective destinations on the rail network in accordance with said desired schedule.

3. (Currently Amended) The method of moving a given set of trains from their respective origins to their respective destinations on a rail network as claimed in claim 2, wherein said objective function used to evaluate each schedule is the sum of the lateness of each train, wherein the lateness of each train is given by the function:

$$Z^i(a_{id}) = \begin{cases} 0 & a_{id} \le a_i^* \\ a_{id} - a_i^* & a_{id} > a_i^* \end{cases}$$

where a_{id} is the actual arrival time of train i at the ~~is~~ destination while $a_i{}^*$ is the desired arrival time.

4. (Currently Amended) The method of moving a given set of trains from their respective origins to their respective destinations on a rail network as claimed in claim 2, wherein track capacity constraints are included in the objective function by means of lagrange ~~langrange~~ multipliers.

5. (Currently Amended) The method of moving a given set of trains from their respective origins to their respective destinations on a rail network as claimed in claim 3, wherein track capacity constraints are included in the objective function by means of lagrange ~~langrange~~ multipliers.

6. (Previously Presented) The method of moving a given set of trains from their respective origins to their respective destinations on a rail network as claimed in claim 2, wherein a heuristic method is used to remove any infeasible train movements.

7. (Canceled)

8. (Currently Amended) The method of moving a given set of trains from their respective origins to their respective destinations on a rail network as claimed in claim

1 ~~claim 7~~, wherein the size ~~of ϵ~~ of the perturbation ϵ ~~perturbations~~ added to the dispatch decision time ~~train start and finish times~~ is governed by the parameter α and is given by

$$\epsilon = \alpha\, U(0,1)$$

where $U(0,1)$ is a uniformly distributed random variable on the interval [0,1].

9. (New) The method of moving a given set of trains from their respective origins to their respective destinations on a railway network as claimed in claim 1, wherein said objective function is the sum of the lateness costs of each train, wherein the lateness cost of each train is zero if the train arrives at its destination before the desired arrival time, and some train dependent multiple of the lateness if the train arrives after the desired arrival time.

IN THE SPECIFICATION

In the Disclosure

Please replace paragraph [0011] of the published patent application US2005/0261946 with the following paragraph:

[0011] The invention provides a method and system for determining the efficient movement of trains on a network. ~~and in particular the development of an efficient strategy for controlling a flight of trains travelling in the same direction along a rail corridor.~~

Immediately after paragraph [0020], please insert the following section heading:

BRIEF DESCRIPTION OF THE DRAWINGS

Immediately after "BRIEF DESCRIPTION OF THE DRAWINGS" please insert the following paragraphs [0020.1] through [0020.6]

[0020.1] FIG. 1 is a schematic view of a plurality of track segments.

[0020.2] FIG. 2 illustrates a network model showing segments and stations enclosed by broken lines.

[0020.3] FIG. 3 illustrates histogram results of a railway corridor.

[0020.4] FIG. 4 illustrates histogram results of another railway corridor.

[0020.5] FIG. 5 illustrates a crossing schedule for a rail corridor.

[0020.6] FIG. 6 illustrates a crossing schedule for another rail corridor.

Please replace paragraph [0022] of the published patent application US2005/0261946 with the following paragraph:

[0022] Consider a railway system with the rail tracks modelled as a set of junctions and sections of rail joining them. The basic network unit of track is called a segment, defined below, and illustrated in Figures 1 and 2.

Please replace paragraph [0034] of the published patent application US2005/0261946 with the following paragraph:

[0034]While a track segment can only accommodate one train at a time for trains travelling in opposite directions, if a track segment has internal signalling then it may be able to accommodate more than one train moving in the same direction. These following trains must be kept separated from each other by some minimum distance or time. This is achieved by having a following clearance time which governs the minimum separation between the front of following trains at entry and exit from a segment. This following clearance time will be a function of such things as train speed, the signalling system used, safety margins required and train length. An opposing clearance time is also needed to govern the minimum time separation between the front of one train leaving a segment and a train travelling in the reverse direction seeking to gain access to the same segment.

Please delete paragraph [0035].

Please delete paragraph [0036].

Please replace paragraph [0040] of the published patent application US2005/0261946 with the following paragraph:

[0040] ~~Trains A and C will not fit on segment 4. This system will deadlock if train C is morved onto 6. Consequently the authors have investigated a more general theory of deadlock avoidance but it is computationally demanding.~~ In the present invention only a limited deadlock avoidance protocol is implemented. The first advantage is that it is possible to retain a rich set of potential schedules only discarding them at deadlock or near certain deadlock states. The second advantage is that the avoidance procedure is computationally efficient and speed of schedule generation is a requirement of the system. The problem space search method used to construct the schedules randomly perturbates segment running times of individual trains to influence the order in which trains are dispatched. With this randomised search procedure it is good enough to reduce the occurrence of deadlock and simply throw away schedules that terminate in deadlock. The only small disadvantage is the loss of some computational efficiency because some potential schedules are pursued further than necessary.

Please replace paragraph [0058] of the published patent application US2005/0261946 with the following paragraph:

[0058] This mixed integer formulation has been implemented in GAMS (General Algebraic Modelling System) and can solve larger problems than our initial formulation, described below. It has been used to solve problems with 14 trains and 10 track segments. The main problem with this formulation is that it is for a single line track only, and assumes infinite capacity at stations. However, for such problems it generates optimal solutions that can be used to check the results of other timetabling methods.

Please replace paragraph [0072] of the published patent application US2005/0261946 with the following paragraph:

[0072] ~~Langrangean~~ Lagrangian Relaxation

Please replace paragraph [0073] of the published patent application US2005/0261946 with the following paragraph:

[0073] ~~Langrangean~~ Lagrangean relaxation has long been recognised as an effective solution method for constrained optimisation. Many computationally hard problems complicated by a set of difficult constraints can be decomposed into problems with a simpler structure. In our railway scheduling model the track capacity constraints are removed from the constraint set and placed in the objective function by the use of lagrange multipliers. These multipliers can be interpreted as the cost for using the track at a particular time. The higher the price on a track segment at a particular time the less likely it is to be used by trains at that time. This relaxed for of the scheduling problem allows us to reduce the problem to a series of shortest path problems for individual trains on the network. Trains are scheduled through the rail network one at a time through the matrix of prices (Lagrange multipliers) along their least cost path irrespective of other trains in the network. The solution of the relaxed problem with section capacity constraints removed may result in an infeasible schedule. A heuristic method must then be employed to remove the infeasible train movements and produce a feasible schedule.

Please replace paragraph [0084] of the published patent application US2005/0261946 with the following paragraph:

[0084] 3. Form ~~From~~ a contender set of trains consisting of all trains that have as their next move a dispatch from station S_i to S_j and vice-versa.

Please replace paragraph [0095] of the published patent application US2005/0261946 with the following paragraph:

[0095] The problem space search dispatcher has been tested on two Australian railway networks. The objective function is that is used to evaluate each schedule is the sum of the lateness of each train. The lateness of each train is given by the function

$$Z^i(a_{id}) = \begin{cases} 0 & a_{id} \le a_i^* \\ a_{id} - a_i^* & a_{id} > a_i^* \end{cases}$$

where a_{id} is the actual arrival time of train i at is destination while a_i* is the desired arrival time. ~~The problem space search dispatcher was coded in Pascal and run on a Unix workstation.~~

Please replace paragraph [0098] of the published patent application US2005/0261946 with the following paragraph:

[0098] A histogram of the results from both phase I and phase II of the problem space search can be found in figure 3. In both phases 3000 feasible schedules were constructed and the histograms have been plotted using buckets of 1000 seconds. The lowest cost schedule found in phase I had a cost of 152000 seconds while the overall best solution was found in phase II with a cost of 145000 seconds. As can be seen in Figure 3 of the phase II distribution of solution costs has been significantly skewed towards the low cost end when compared with the results from phase I. The best solution found is represented as a train graph in figure 5. Current best practice for this same actual scheduling task on the North Coast line is 205000 seconds. This is shown as the vertical line in figure 3. Our procedure is therefore generating a raft of better schedules, the best being approximately 30% lower than current practice. ~~The program took 10 minutes to run.~~

Please replace paragraph [0100] of the published patent application US2005/0261946 with the following paragraph:

[0100] The results from both phases of the problem space search are presented in figure 4. Once again 3000 feasible schedules were constructed in both phases with the best schedule being found in phase II. The minimum cost schedule found in phase I was 53660 seconds while in phase II the best one found had a cost of 52945 seconds. Note the effect of the weights in skewing the histogram in phase II towards the low cost region. Figure 6 shows the train graph of the best found solution. Current best practice

for the Sydney to Melbourne scheduling task has a cost of 85000 seconds which is shown as the vertical line in Figure 4. ~~For this larger problem the running time was 29 minutes.~~

Please delete paragraphs [0102] to [0108].